Newtown Ballyhea GWB: Summary of Initial Characterisation.

Hydrometric Area Local Authority	Associated surface water features	Associated terrestrial ecosystem(s)	Area (km^2)
18 Cork Co. Co. (Northern Division) Limerick Co.Co.	Rivers: Awbeg Lake: Aglish Cross Roads Lake	None currently listed	21.9

Topography	This small GWB comprises a mixture of Carboniferous rocks on the north flank of the Ballyhoura Mountains, falling within the Awbeg catchment. The GWB is a lateral continuation of the much larger Mitchelstown GWB to the southwest. Elevations range from about 100 m OD in the Awbeg valley to about 140 m OD. The topography is gently sloping.	
Geology and Aquifers	**Aquifer categories**	**Ll:** Locally important aquifer which is moderately productive only in local zones (83%) **Rk^d*:** Regionally important* karstified aquifer dominated by diffuse flow (11%) **Pl:** Poor aquifer which is generally unproductive except for local zones (6%) ** These areas are karstified but are unlikely to be regionally important due to their small size (<10km^2) – a new classification code to represent these areas is pending.*
	Main aquifer lithologies	Dinantian Lower Impure Limestones (42%), Dinantian Upper Impure Limestones (34%), Dinantian Pure Unbedded Limestones (11%), Dinantian (early) Sandstones Shales and Limestones (6%) and Namurian Undifferentiated (8%).
	Key structures	During the Variscan Orogeny rocks in the South Munster region were compressed from the south into a series of folds on east west axes. The Carboniferous Limestones were preserved in the fold troughs (synclines) which today line elongate east-west trending valleys separated by the intervening sandstone ridges. The youngest rocks are at the centre of the syncline. Extensive fracturing and faulting accompanied the folding of the rocks which has significantly enhanced the permeability of the limestones in this region. This body is part of the southern flank of a syncline. The synclines are cut by a series of shear faults trending approximately north-south and a series of thrust faults with a general east-west trend. The occurrence of thrust faults and transverse faults may influence groundwater flow. Transverse faults divide the area into compartments and can act as preferential flow zones. Some thrust faults may act as barriers causing springs to rise near the thrust fault plane. Thrust faults within formations may act as a focus for karstification because the limestone has been weakened (Ree & Rot, 1981). Frequent jointing is also recorded in the pure limestones in this region. From geological observations it is known that the direction of the joints is broadly north-south and east-west. From cave plans for Castlepook cave, east of Buttevant, it can be seen that karstification is best developed along north south joints (Ree & Rot, 1981).
	Key properties	The pure unbedded limestones of the South Munster region are highly productive. The Dinantian Lower and Upper Impure Limestones of this GWB are considered to be relatively low permeability rocks except where zones of higher permeability have been created as a result of structural deformation by folding and faulting. In general, the Dinantian Impure Limestones aquifer transmissivities will be in the range 2-20 m^2/d. Aquifer storativity will be low in all rock units. Groundwater gradients are likely to be in the range 0.01 to 0.04.
	Thickness	The Dinantian Lower Impure Limestones are 140 m thick in the Kilmaclenine Anticline (Pracht, 1997). Most groundwater flow in this GWB is expected to occur within the top 15 m of the aquifer, in the layer that comprises a weathered zone of a few metres and a connected fractured zone below this. Deeper flows can occur along generally isolated faults or significant fractures.
Overlying Strata	**Lithologies**	*Subsoil Types identified in Newtown Ballyhay GWB by Teagasc Parent Material Mapping (Draft): Alluvium (A); Limestone sands and gravels (Carboniferous) (GLs); Made Ground (Made); Rock outcrop and rock close to surface (Rck); Till – Devonian Sandstone Till (TDSs), Namurian Sandstone and Shale Till (TNSSs).* A Groundwater Protection Scheme has not been prepared for this area and the permeability of the subsoil has not been mapped in this area. The subsoil is predominantly Till.
	Thickness	Borehole depth to bedrock data are very sparse for this GWB. It is likely that subsoils are generally >3 m deep.
	% area aquifer near surface	
	Vulnerability	There is no Groundwater Vulnerability Map available for North Cork at present. From the very limited subsoil and depth to bedrock data available, vulnerability is probably mostly Moderate to High.
Rec har	**Main recharge mechanisms**	Diffuse recharge will occur via rainfall percolating through the subsoil. The proportion of the effective rainfall that will recharge the aquifer is determined by the permeability of the soil and subsoil, and by the slope.

	Est. recharge rates	*To be assessed.*
Discharge	**Large springs and high yielding wells (m^3/d)**	*Note: The following data needs to be checked and updated by RBD Project Consultants.* Data from GSI Well Database: Additional data from EPA Groundwater Sources List:
	Main discharge mechanisms	The main discharges from this small GWB will be to small springs or seeps within the body. There may be some small through flow down gradient to the neighbouring more permeable Dinantian Pure Unbedded Limestones of the Mitchelstown GWB.
	Hydrochemical Signature	There are no hydrochemical data specific to this GWB currently available. The hydrochemical signature of groundwater in the centre of the GWB is expected to be similar to that of other GWBs of similar rock units. The water will be hard.
Groundwater Flow Paths		These rocks have no intergranular permeability; groundwater flow occurs in fractures and faults. Groundwater flow is expected to be concentrated in fractured and weathered zones and in the vicinity of fault zones. Permeability is highest in the upper few metres but generally decreases rapidly with depth. In general, groundwater flow is concentrated in the upper 15 m of the aquifer, although deeper inflows from along fault zones or connected fractures can be encountered. Groundwater flow will be of a local nature with generally short groundwater flow paths. Groundwater flow will flow radially out from the high ground in the centre of the body. Groundwater is generally unconfined in this groundwater body.
Groundwater & Surface water interactions		Groundwater will discharge locally to streams and rivers crossing the aquifer and also to small springs and seeps. Owing to the poor productivity of the aquifers in this body it is unlikely that any major groundwater - surface water interactions occur. Baseflow to rivers and streams is likely to be relatively low.
Conceptual model		• The groundwater body is bounded to the southwest by the karstified limestones of the Mitchelstown GWB. • Ground elevations are highest on the lower slopes of the Ballyhoura Mountains (140 m OD) which slope gently downwards towards Awbeg river (100 m OD). • The groundwater body comprises rocks with low transmissivity and storativity, although localised zones of enhanced permeability occur along fault zones. • Flow occurs along fractures, joints and major faults. Flows in the aquifer are generally concentrated in a thin zone at the top of the rock, although deeper groundwater flows along faults and major fractures. • Diffuse recharge occurs across the GWB through the subsoils and rock outcrops. • Groundwater is generally unconfined. Flow path lengths are generally short, ranging from 30-300 m. Local groundwater flow directions are controlled by local topography. • The main discharges from this small GWB will be to small springs or seeps within the body and as throughflow down-gradient to the neighbouring more permeable Limestones of the Mitchelstown GWB.
Attachments		
Instrumentation		**Stream gauges:** None **EPA Water Level Monitoring boreholes:** None **EPA Representative Monitoring points:** None
Information Sources		Deakin J, Daly D, Coxon C (1998) *County Limerick Groundwater Protection Scheme*. Main report. Final report to Limerick County Council, 64 pp. Kelly D, Leader U, Wright G (2002) *South Cork Groundwater Protection Scheme*. Main Report. Final Report to South Cork County Council. Geological Survey of Ireland. Pracht M (1997) *Geology of Kerry-Cork: a geological description, to accompany bedrock geology 1:100,000 scale map, Sheet 21, Kerry - Cork.* Geological Survey of Ireland. 70pp
Disclaimer		Note that all calculation and interpretations presented in this report represent estimations based on the information sources described above and established hydrogeological formulae

List of Rock units in Newtown Ballyhay GWB

Rock unit name and code	Description	Rock unit group	Aquifer Classification
Namurian undifferentiated (NAM)	Sandstone	Namurian Undifferentiated	Ll
Copstown Limestone Formation (CT)	Dark-grey well-bedded muddy limestone	Dinantian Upper Impure Limestone	Ll

Visean Limestones (undifferentiated) (VIS)	Undifferentiated limestone	Dinantian Upper Impure Limestones	Ll
Waulsortian Limestones (WA)	Massive unbedded fine-grained limestone	Dinantian Pure Unbedded Limestones	Rkd* Small areas – final classification pending
Ballysteen Formation (BA)	Fossiliferous dark-grey muddy limestone	Dinantian Lower Impure Limestones	Ll
Ballymartin Formation (BT)	Limestone & dark grey calcareous shale	Dinantian Lower Impure Limestones	Ll
Lower Limestone Shale (LLS)	Sandstone, mudstone & thin limestone	Dinantian (early) Sandstone, Shales and Limestones	Pl

NOTES

Newtown Ballyhay GWB (For reference only)